WIRE SYSTEM

DISCUSSION OF ELECTRICAL INTELLIGENCE

LETTER OF

THEO. N. VAIL

IN RESPONSE TO
REQUEST OF

HON. JOHN A. MOON

CHAIRMAN
COMMITTEE ON POST OFFICE
AND POST ROADS, H. R.

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SUMMARY

The following is a summary of the contents of a letter written to Hon. John A. Moon, Chairman Committee on Post Office and Post Roads, House of Representatives, Washington, D. C., upon his request by Theo. N. Vail, of the American Telephone and Telegraph Company. The letter refers to House Bill 368.

It is admitted that the great utilities of interchange and intercommunication, which have been so largely instrumental in the development of the economic and social world and upon which the progress and continuity of such development depend, are suffering from the application and interpretation of existing laws concerning control and regulation, and the proposed bill calls for time to enable some plan of organization to be perfected.

There is without doubt an opportunity for a great piece of beneficial and constructive work by combining and coordinating all the various existing utility services or those that are complementary and supplementary into one or more well-balanced systems, the extent of which should be determined by the nature of the service, by the extent of the service rendered, and by commercial, geographic, economic reasons; and by combining in a direct manner, and as far as possible divorced from political or partisan or class influence, the requisite power and authority of the Federal Government expressed in a mandate to equilibrate revenue, operating costs, and capital charges, with an operating organization, adapted to the requirements of the service, and based on the methods which experience, enterprise, and operation in the industrial world have shown to be effective efficient, and economical.

It is not my understanding that this bill is a government ownership and operating measure, but rather a definite purpose to give sufficient time to prepare and present to Congress a specific proposition for reorganization which will work for efficiency and economy of the international and intranational wire systems operated and controlled from the United

States. There would seem to be no question as to the wisdom of such programme.

A thoroughly considered, well-thought-out solution cannot be prepared under pressure or in a short time.

It is recognized that in the interests of the public, the utilities should not be returned to the owners without some correction of the existing deficiencies in regulation and control, hence it would seem highly desirable for the country and for the proprietors that time should be given for such a solution.

The principal problem will be to find a plan which will not leave opportunity for, and perpetuate in some other form the same evils which now exist in, the multiplicity of uncorrelated, irresponsible, complex, contradictory, and overlapping forms of control or regulation, or leave opportunity for unjudicial and biased action or selfish aggression.

ELECTRICAL TRANSMISSION OF INTELLIGENCE

It has developed early in the evolution of the telephone service that while there were common features in the technique, the service rendered was entirely distinct from the telegraph, each having its own particular field, not competitive but complementary. Long before the common use of the wire plant for both purposes was developed, the advantage of a combined system of telegraph and telephone under one control was recognized.

The science of industrial application of electricity is almost as new as the telephone. The whole telephone art had to be created, it did not exist, nor was there, as is usual in new enterprises, anything analogous to it upon which to base action and policy. On pages 7 to 12 of the letter will be found a more or less detailed account of the evolution of the art of electrical transmission of intelligence and the inevitable conclusion to be drawn from that experience, which is—the wire system of the future will be one nation-wide

system, under single control, by or over which direct connection can be established between any two places for the electrical transmission of any communication or of the spoken word; and every individual place will be the center of the system for transmission in any direction to the limit of transmission.

With less than half the weight of copper that was formerly used to transmit one conversation, it is now possible to transmit over one wire circuit at the same time at least five and one-half telephonic messages and a large multiple of the number of telegraph messages formerly possible.

It can be safely said that with the same weight of copper which was formerly required for one telegraph or one telephone circuit, ten or twelve times the telephone and telegraph use is now possible at any one time, and when we consider the total capacity which in the telephone system is unutilized at certain hours, many new services in addition which would be of great benefit to our commercial and economic and social organizations can be introduced. Distant accomplishment is usually foreshadowed by present evidence, and judging from the past, there is abundant evidence that the future accomplishments will be greater than any that have gone before.

The measure of the extent and comprehensiveness of the future wire system is and always will be the telephone system.

Upon the interconnecting system of wires necessary for telephone purposes, every other possible form of electrical-wire transmission of intelligence or exchange of ideas can be superimposed with abundant room for a great expansion of new and cheaper services.

On pages 12 to 19 of the letter will be found some interesting features of the Bell System.

CABLES

Should the United States become the center of a cable system commensurate with and sufficient to fully protect its political and economic position?

Submarine cable plant is the most costly plant for electrical transmission of intelligence. The co-ordinated operation of all cables giving more or less similar service is essential if the most effective cable service is to be had at the lowest possible cost. A certain percentage of cables are out of commission more or less of the time. These interruptions of individual cables extend over long periods, at times a year or more.

If operation is co-ordinated, the total capacity is greater than the total capacity of the systems operated separately, and other but less direct routes can be used to cover periods of emergency.

There is on any cable system a variable load, determined largely by the difference in time and the overlapping business hours in the various countries between which the transmission takes place. This results in a large percentage of unused facilities which under unified operation could be used for circuitous transmission in an emergency or in competition with direct service, or for deferred services at cheaper rates where a little delay is immaterial.

Quick, cheap, abundant, dependable facilities of intercourse and transportation are necessary in the development of regular commerce. If the United States is to maintain commercial supremacy, or even equality, there must be established the great trade forerunners, which in these days of intense activity, is a comprehensive cable system. If American commerce is to be developed, it must have better means of communication at a cost which will not handicap a large volume of business at a small profit. The days of small business and of large profits passed with the clipper ships and indifferent mail communication.

Cable construction and laying take time, and cables cannot be readily removed from an original location except by reconstruction.

The world's system of international electric communication has been built up primarily on the basis of connecting the commercial world with the old centers; focusing these world-facilities, as it were, on the old world's centers of finance, commerce, and industry. National prestige, local interests, competitive enterprise have influenced location,

extension, and combinations so that these facilities are not in all cases arranged to be productive of the maximum possibilities of either broad efficiency or the greatest economy.

The United States is connected with this world system, but on one side as a contributing field to be reached and exploited, and not primarily as a center.

We must give our commerce what it needs and what the commerce of the old countries already has. Our international wire service has become a "utility of necessity," and must be treated accordingly.

From the United States to the greater part of the world electrical intercommunication is expensive and roundabout.

By utilizing and unifying the operations of the existing and abundant transatlantic cable facilities, direct connection can be established with every country in Europe through some immediate rearrangement, and as soon as possible some relaying, relocating, some extension of the old and the laying of some new cables.

While private property must be respected, proprietary rights should not be allowed to obstruct this solution, any more than proprietary rights of any utility should prevent regulated or controlled operation. The constitutional rights in each case are identical.

The United States must be brought into the center of a world system of electrical intercommunication. Its ships and merchants must not depend upon the gracious courtesy of any other country to get direct home-wire communication.

This country is spending thousands of millions of dollars to build ships to compete for foreign commerce and yet leaves the very "essential" to the building up of foreign commerce—quick, reliable intercommunication—entirely to private initiative and to foreign enterprise. With as many tens of millions and the co-operation of the existing cable companies controlled in the United States, a system could be built up which would put the business of the United States, as it were, at the front-door of every business house of the world.

Of what use will be the expenditure of money and effort in behalf of American commerce if there are to be no abundant

available facilities of communication for the agents who spread that commerce and if the ships that carry it cannot have a ready communication without the consent of any foreign nation?

It is to be regretted that the questions of government ownership and of superior foreign rights have been brought into this cable question to handicap the solution of this big and most important problem, which must be settled from an American standpoint by some co-ordinated correlated combination of government authority and private operation or operation founded on the best traditions of private operation free from political interference and combined in a federalized corporation.

There must be no question as to the right or the necessity of the United States to build up a commercial international wire system of which the United States is the center, instead of remaining at one side of an international system which centers in the English Channel. Nor should there be any such a spectacle as an American-owned company obstructing the creation of an all-American cable system.

In making this reply it has been my desire to present the actual conditions and salient features of electric communication and the possibilities of the future.

ERRATUM

Beginning on the top line of page nineteen it should read: "aggregate book value is considerably less than the aggregate of all official appraisements that have been made."

December 30, 1918

Hon. John A. Moon, *Chairman*,

Committee on the Post Office and Post Roads,
Washington, D. C.

My Dear Sir:

Your letter enclosing H. B. 368 and letter of the Postmaster General relating thereto, requesting my views, is received.

It is my assumption that the request covers my views upon the broad question of a proper solution of the problems of the electrical transmission of intelligence by any means, and under such an organization or such policy as will bring about the greatest possible extending and broadening of its usefulness under the present state of the art, and also ensure the greatest possible future development.

It is admitted that the great utilities of interchange and intercommunication, which have been so largely instrumental in the great development of the economic and social world, and upon which the progress and continuity of such development depend, are suffering from the application and interpretation of existing laws concerning control and regulation, and as the proposed bill calls for some plan of organization, it is also my assumption that

my views should also cover some suggestions as to the underlying features of a curative solution of the question of control and regulation.

It is not my understanding that this bill is a Government ownership and operating measure, but its purpose is to give sufficient time to prepare and present to Congress a specific proposition for the reorganization on some basis which will work for efficiency and economy of all the international and intranational wire systems operated and controlled from the United States. There would seem to be no question as to the wisdom of such an attempt.

A thoroughly considered, well-thought-out solution cannot be prepared under pressure or in a short time.

We know the "don'ts" in unmodified government operation, and the "don'ts" in unrestricted private operation, and the "don'ts" in our present uncorrelated, uncoordinated control and regulation, and these should be the guides.

The solution involves new economic practices of which there is little or no direct experience.

It is recognized that in the interests of the public advantage, the utilities should not be returned to the owners without some correction of the existing deficiencies in regulation and control.

Under the present status of Government operation and control, little can be done towards the ultimate solution which must take place, which will not have to be undone when the period of control ends and the sys-

tems are again subjected to the present interpretation and application of existing laws.

It would seem as very desirable for the country that time should be given for such a solution. It would also seem, in simple justice to the owners of the existing systems, that during that period whatever is done by and with the consent of the companies interested and of the public authorities towards partial unification of the wire systems, should be exempted from the application of existing laws.

My position upon Government ownership and operation has been repeatedly and unmistakably expressed.

Unmodified Government ownership and operation is no solution because of the absence of essential factors to efficient operation, such as continuity of administration and consequent lack of opportunity for the full fruition of incentive and initiative; lack of rewards both in large opportunity for promotion and such compensation as will retain those of the organization who have developed qualifications and accomplishment, against the rewards afforded in private industry.

Neither is unregulated or uncontrolled private ownership and operation a solution because of the opportunity for selfish exploitation.

Between these extremes there must be found a solution.

The great difficulty will be to settle upon a solution which will not leave opportunity for, and perpetuate in

some other form the same evils which now exist in, the multiplicity of uncorrelated, irresponsible, complex, contradictory and overlapping forms of control or regulation, or leave opportunity for unjudicial and biased action or selfish aggression.

There is, however, in my opinion, a possibility of a simple, complete and satisfactory solution.

There is without doubt an opportunity for a great piece of beneficial and constructive work by combining and co-ordinating all the various existing utility services, or those that are complementary and supplementary, into one or more well balanced systems, the extent of which should be determined by the nature of the service, by the extent of the service rendered, and by commercial, geographic, economic reasons; and by combining in a direct manner, and as far as possible divorced from political or partisan or class influence, the requisite power and authority of the Federal Government expressed in a mandate to equilibrate revenue, operating costs and capital charges, with an operating organization, adapted to the requirements of the service, and based on the methods, which experience, enterprise and operation in the industrial world have shown to be effective, efficient, and economical.

Government control and regulation and restrictions need the same cure that our utilities do—combination, co-ordination, co-operation—"one system" interdependent and interrelating, with a single or co-ordinated responsible control over all similar utilities, and over all the factors that make for operation, for continuity, for

permanence, for efficiency and suecess, and above all there must be recognition of the fact that neither labor, management nor capital is independent of the others, and that neither can permanently get any benefit at the sacrifice of the others, and that permanent maintenance of operating organization depends upon reasonable rewards for the actual contribution of each to the work.

ELECTRICAL TRANSMISSION OF INTELLIGENCE

Facilities for interchange of intelligence or ideas by electrical transmission are substantially different from facilities for other interchange, in that nothing tangible is transmitted or transported; the transmission is a series of electric vibrations or interruptions, totally dissimilar to transportation of goods, letters, passengers, in which the actually tangible thing is carried in bulk or in quantity and can be handled or transferred; and the vehicle or the train of vehicles in which it is carried is the nearest to a unit of transportation.

All utilities of transportation can be divided up into systems of greater or less extent. In through passenger or freight service there is a limit to direct continuous transit due to the methods and machinery and facilities of transportation. In telegraphy, the more direct and continuous the transmission, the more perfect the service; but in the telephone service, direct and continuous transmission is essential to any service. In all other utilities of intercommunication, the transmission or transportation must be from one point to some other point, and

need not be continuous, direct or necessarily over the same system. Telephone transmission however must be direct and continuous, it is an actual conversation between two parties; the connection must be continuous, direct and over the same system. This introduces an essential prerequisite to service in telephony which does not exist in any other public service.

The transmitting currents of the telegraph and telephone are similar in many of their features, but the telegraph transmits vibrations or interruptions of current which are translated into letters and written words, while the telephone transmits vibrations or partial interruptions of the current which in themselves form the spoken word.

It has developed early in the evolution of the telephone service that while there were common features in the technique, the service rendered was entirely distinct, each having its own particular field, not competitive but complementary. Long before the common use of the wire plant for both purposes was developed, the advantage of a combined system of telegraph and telephone under one control was recognized.

The ideal of one wire system, universal (national), interdependent, intercommunicating, under one control, has been consistently pursued by the Bell System, against the cry of monopoly and usurpation and charges of aggression and so-called competition. This ideal has been completely vindicated in that one system is now recognized as the only method for comprehensive tele-

phone service, and is now being urged on opposing systems, instead of being opposed.

The combination of the telephone and telegraph systems, which was undertaken by the Bell System but set aside under the interpretation and the application of existing laws, demonstrated in the short time of its existence the advantages.

In 1909 it was thought that a great public benefit could be obtained from the union of the telephone and telegraph and that by gradually utilizing all wires for both purposes, and by making one plant serve for both purposes, the maintenance, the organization and above all the depreciation, which is very large in open wire systems, of one plant could be saved. While the immediate utilization of one plant for both purposes would require reconstruction and rearrangement of facilities which would be too costly and make too much disturbance, the ultimate utilization would be made in the ordinary course of maintenance and reconstruction in the course of a few years with little cost and no disturbance. It was, however, immediately possible to make every one of the ten million telephone stations day and night telegraph stations, and thus reduce the number of telegraph offices which were maintained at a loss, and to expedite and cheapen delivery of messages beyond the delivery districts or in the country; and it was also possible to introduce some new forms of cheap deferred service.

The wire system of the future will be one nation-wide system, under single control, by or over which direct connection can be established between any two places for

the electrical transmission of any communication or of the spoken word; and every individual place will be the center of the system for transmission in any direction to the limit of transmission.

The science of industrial application of electricity is almost as new as the telephone. The whole telephone art had to be created, it did not exist, nor was there, as is usual in new enterprises, anything analogous to it upon which to base action and policy. It was necessary from the very beginning of the telephone development by the Bell System to maintain a research investigation experimental department. At first small and inconspicuous, but extremely alert and wide-awake, it has grown into one of the largest laboratories of the application of science to industrial development in the world, and engages the services of a large number of the most eminent scientists who are devoting themselves to the unfolding of natural laws and phenomena and their application to the art of electrical transmission of intelligence. To this branch or department is due the fact that this country leads the world in that art, and its work has made possible a continuous reduction in the average charges per unit of service through the savings in cost of operation, equipment, construction, etc. It is estimated that the present savings over methods prevailing not many years ago, in operation and construction, amount to at least $50,000,000 a year.

The marked development which justified the early belief in the common factors of telephonic and telegraphic evolution was the superimposing on the telephone wires simultaneous telegraph transmission—now so developed that all toll lines of any length are being or can be used for the dual purpose. Among the multitude of other improvements was the twisted pair wire circuit which neutralized extraneous noises induced by high voltage electric power or light transmission and by static currents which are so deadly and so limit the usefulness of wireless transmission; and the multiple switchboard, which made immediate connections possible in exchange service; these two have contributed more than any other two things to make exchange and long-line service popular and practicable.

The development of the utilization of plant and the search for new uses both for telephone and telegraph were continuous.

The multiplexing of the telegraph side of the telephone wire, the phantom telephone circuit by which a third telephonic circuit could be superimposed on every two telephone circuits, were two very important results. The studies and observations on applied telephone practice may be said to have greatly cheapened, and to have revolutionized apparatus and operating methods, each few years. The distance of transmission through aerial and underground cables was extended from a few miles to 500 miles and now it is certain of being extended to 1,000 miles or more. This will ultimately be productive of great economy on leads carrying a large number of

wires and of great efficiency in bridging districts where there is frequent occurrence of destructive sleet and wind storms. The reduction of the size of the wire and the weight of copper required in the transmission circuits not only greatly reduced the cost of material, but made it possible to use in the underground conduits cables with as high as thirty times the number of circuits for which they were originally intended. When we consider that there are over 20,000,000 miles of copper wire in use and the reduction in weight to one-half or even one-quarter of what was formerly needed, the saving can be appreciated. When we realize that the underground conduits for the telephone cables have cost over $100,000,000, some idea of the saving in construction through increased capacity can be formed. Open wire transmission was developed from a somewhat indifferent transmission from New York to Chicago requiring special terminals in exchanges, to commercial transmission across the continent from any exchange terminal, and at the same time it was made possible to run the long distance circuits through the underground exchange systems and not around them as was the practice.

Early in 1915, after several years of experimenting, research and investigation, wireless or radio telephoning was made a practical demonstrated success. Through the courtesy and assistance of our Navy Department in giving us the use of the Arlington wireless station, and the co-operation of Naval officials, the voice was transmitted by radio from Arlington, Va., to Paris and Hawaii by radio transmission, where were stationed members of

the research department of the Bell System. The Secretary of the Navy from his office talked by wire and wireless to the commander of a war vessel off Hatteras, as did also the Commandant from Mare Island, California, by transcontinental wire and radio. This radio has been most useful in our late war. Through the co-operation of officers of the Signal Corps and the experts of the Bell System, it has been adapted to communication between aeroplanes in the air and between them and ground stations, and it was used with great effect in locating hidden guns, in communicating the aero observations of the effect of bombardments, etc. It was also of great service in the submarine warfare. It is now possible to establish, and had it not been for the interruption caused by the war, there would have been in operation, a combination of aero and wire transmission between the land exchanges and vessels off the coast.

A method of multiplex typewriter transmission has been developed which many times augments the telegraphic capacity of the wires, and only recently the practical application of a method of multiplex telephony, the result of the work of years, has been made, by which four or more telephone circuits can be superimposed on the regular telephone circuit, and curiously enough the transmission over the superimposed circuits is superior to that over the regular circuit. It is not a valuable but an interesting scientific feature that it is possible for two people at one end of the circuit to talk to each other via a distant point over the same circuit.

These great developments of the utilization of plant for simultaneous and greatly increased service are the latest practical applications of the work of the technical department of the Bell System. With less than half the weight of copper that was formerly used to transmit one conversation, it is now possible to transmit over one wire circuit at the same time at least five and one-half telephonic messages and a large multiple of the number of telegraph messages formerly possible.

While these new uses require the most delicate balancing and adjusting and close attention, they are simple in operation. To introduce them, however, requires so much rearrangement of circuits and instruments that immediate utilization is too costly and it must be done—as it can be at small cost—in the process of reconstruction over a course of years.

It can be safely said that with the same weight of copper which was formerly required for one telegraph or one telephone circuit, ten or twelve times the telephone and telegraph use is now possible at any one time, and when we consider the total capacity which in the telephone system is unutilized at certain hours, many new services in addition which would be of great benefit to our commercial and economic and social organizations can be introduced. Distant accomplishment is usually foreshadowed by present evidence, and judging from the past, there is abundant evidence that the future accomplishments will be greater than any that have gone before.

While these results are the work of and were possible only because of this technical scientific department of the

system, much has been done and much will be done by individuals working along more or less the same general lines of investigation. Such work has been contributory. Almost without exception, improvements in apparatus or operation which are considered integral or complete in themselves are really the co-ordinated combined results of many individuals working upon many ideas in connection with experimentation and practical application and to obtain certain results. In fact, the art has reached a point in development where it is impossible to differentiate research and experimentation as between the separate methods of transmission, and all laboratory and experimental work in all lines must be co-ordinated and carried on in connection with the practical operation over a system corresponding in extent with the system upon which it is intended to be used. The work of investigation, research and experimentation is at best expensive, but is indispensable in a new art and the cost if spread over a large system is relatively small.

Whatever the status of a wire system, government owned or private owned, it is and must be a virtual monopoly, combining both telegraph and telephone. Competition in the telephone service in its real sense cannot exist. If there are two systems in any place, the choice of the system is controlled by the list of subscribers connected on one or the other of the systems; beyond a small percentage, there would be no duplications. Opposition telephone service means two payments to get complete service. Each system, where there are two

or more, offers an entirely different service in that the great majority of subscribers are not the same.

Competition in the telegraph business in the true sense of the word has not existed for years. It is true that there has been competition for, or a division of, the profitable business at less than one-fifth of the public telegraph offices, serving about one-half the population in this country. There is no competition at the other four-fifths of the offices which are maintained at a loss for the purpose of giving a public and necessary service to about 50% of the population; and one of the competing companies frankly states in its published reports that it has no intention of competing for unprofitable business. If this is to be the rule, a large part of the public could not be given the essential facilities for every-day life.

In every public service, the revenue comes from uniform charges based on average costs. Some service must be rendered at a loss; the average profit must carry the business as a whole. When competition divides the profitable business, the average charge must be not only sufficient to carry the unprofitable business, but also to pay the fixed charges and operation of a duplicate and unnecessary plant.

The public pays for competition either in cost of maintaining duplicate systems, or in lack of quality or quantity and extent of service.

In 1917 the Bell System of toll lines alone embraced over 350,000 miles of pole lines and 3,500,000 miles of wire, of which 1,000,000 miles were underground, while

the combined telegraph systems embraced less than 250,000 miles of pole line and 2,000,000 miles of wire.

These telegraph facilities represent an investment of at least $200,000,000 in poles and wires alone, without equipment. Depreciation and destruction of open wires and their maintenance call for at least 10% a year, while interest charges are 6%, totaling $32,000,000 a year additional cost for the maintenance of a separate system, a sum equal to the gross telegraph revenue only a few years ago.

While the economy of the combined system could not be brought about immediately, as the cost of the reconstruction and rearrangement for that purpose would be very great and disturbing, it could all be brought about with small increased cost in a few years as maintenance and destruction and depreciation call for reconstruction, and substantially all existing plant can be utilized for necessary expansion.

While much of this may at first seem to be immaterial to the question under consideration, it is most pertinent. In these accomplished results and developed experience are the potent factors which must control the final determination of the solution of the problem. Based on experience of the past and foreshadowed evolution of the future, the evolution of the economic and practical operation of electrical transmission in all its forms, is indisputably towards one common system embracing all methods of transmission of intelligence.

The measure of the extent and comprehensiveness of the future wire system is and always will be the telephone system.

Upon the interconnecting system of wires necessary for telephone purposes, every other possible form of electrical wire transmission of intelligence or exchange of ideas can be superimposed with abundant room for a great expansion of new and cheaper services.

In all this development, we claim for the Bell System a respect and regard for public service which has not been destroyed or handicapped by private selfish interests. The shareholders of the American Telephone and Telegraph Company have been content with a return on their investment which in good seasons as well as bad has been sufficient, but not more than sufficient, to enable them to raise the large sums necessary to meet the public demands for enlarged public service. This return has not been materially increased, nor have any extra dividends or "plums" been divided for at least thirty years; all surplus has been put back into plant and the public have had the use of it.

There is no "water" in the securities, as there has been paid in premiums to the treasury of the American Telephone and Telegraph Company considerably more than the par value of the stock outstanding.

The amount paid out as dividends and interest in 1917 was 4.74% on the actual book value of the plant, and the

aggregate book value exceeds the aggregate of all official appraisements that have been made. Average charges per unit of service have been continuously reduced; a very large majority get the service at much less than the average charges, and some class of service has been placed within the reach of all.

In order that there should be a nation-wide system, large cities and extensive areas, in fact whole states, have been operated at an actual loss by the Bell System. The service and plant have been maintained at a uniform standard that transmission over the whole country might be had in every direction and between all points. Otherwise, it would be impossible to give dependable local service except in certain and restricted areas, and long distance service only between the principal places and there not through the regular exchange service. This has only been possible because from the beginning all the surplus earnings over and above the regular charges have been invested in plant of which the public has had the use directly and indirectly without any capital charge.

Notwithstanding the great increases in wages and material, which have more than doubled costs, only in places where glaring inequalities existed has any increase in charges been made on this account, and it is expected that not more than an average of 10% increase will be necessary to meet the abnormal increases in costs.

This constitutes what is in fact a reduction of at least 50% in the charges for telephone service, as compared with the increased charges for every other class of service and as compared with relative ability to pay.

CABLES

Should the United States become the center of a cable system commensurate with and sufficient to fully protect its political and economic position?

Substantially all the developments of electrical transmission by open wire have reflected on submarine cable and aero electrical transmission. It is impossible at this advanced state in the art of electrical transmission to differentiate experimentation or investigation between the different methods, and many of the new devices and principles which have been developed are most far-reaching in their applicability to all systems of transmission. Submarine cable capacity for transmission has already been greatly increased, and the prospects of still greater increase are promising.

Over land lines, submarine cables and radio it is within limits to say that electric signals can be transmitted any distance, even around the world; over land lines and aero the same may be said of the transmission of speech, but as yet the transmission of speech over submarine cables of any length has not been possible.

Submarine cable plant is the most costly plant for electrical transmission of intelligence. The co-ordinated operation of all cables giving more or less similar service is

essential if the most effective cable service is to be had at the lowest possible cost. A certain percentage of cables are out of commission all the time, and a large percentage most of the time. These interruptions of individual cables extend over long periods, at times a year or more. This makes competition wasteful and necessitates high prices for service.

If operation is co-ordinated, the total capacity is greater than the total capacity of the systems operated separately, and other but less direct routes can be used to cover periods of emergency.

There is on any cable system a variable load, determined largely by the difference in time and the overlapping business hours in the various countries between which the transmission takes place. This results in a large percentage of unused facilities which under unified operation could be used for circuitous transmission in an emergency or in competition with direct service, or for deferred services at cheaper rates where a little delay is immaterial.

INTERNATIONAL INTERCOMMUNICATION

Commerce depends on facilities of intercommunication and intercourse. Without them, it is impossible. With poor facilities it is speculative, uncertain, because of the time and risk involved. Quick communication reduces the capital needed and makes frequent "turn-over" possible.

If the purchaser and seller at distant points can get into quick communication, business can be done on small margin. If days, weeks or months are necessary to complete the purchase and sale, the margin must be relatively large, at the expense of the producer.

Quick, cheap, abundant, dependable facilities of intercourse and transportation are necessary in the development of regular commerce. We are building the ships and ships can be transferred from one port to another as commerce demands. To keep our ships and our mercantile agents in touch with home ports and home offices, we are now dependent on facilities centering on the other side of the ocean.

My efforts towards an intranational and international electric communication system are of long standing. The whole development of the Bell Telephone System from the beginning was based on comprehensive intercommunicating system by wire. When the American Telephone and Telegraph Company bought the Western Union, its first attempt was to secure transatlantic cables by laying one and leasing several. Some new and beneficial services were inaugurated, more were contemplated. It was our intention to develop this system and ultimately bring the United States into focus with the great arterial cable systems throughout the world. The combination was not then countenanced by the Government.

If the United States is to maintain commercial supremacy or even equality, there must be established the great trade forerunners, which in these days of intense activity,

is a comprehensive cable system. If American commerce is to be developed, it must have better means of communication at a cost which will not handicap a large volume of business at a small profit. The days of small business and of large profits passed with the clipper ships and indifferent mail communication.

Mail communication is by far too slow for commercial development in these days. Wireless communication is yet far from perfect, and while it has its place and an important one, it is not probable that it will ever be dependable. The only existing method of quick communication is by the wire and cable. These facilities take time and enterprise to establish. Cable construction and laying take time and cables cannot be readily moved from an original location except by reconstruction.

Where abundant facilities exist, however, if under one control, they can oftentime be readily and quickly rearranged and connected to suit changing conditions.

The world's system of international electric communication, largely cable, while comprehensive, abundant and efficient, has been built up primarily on the basis of connecting the commercial world with the old world centers; focusing these world facilities, as it were, on the old world's centers of finance, commerce and industry. National prestige, local interests, competitive enterprise have influenced location, extension and combinations so that these facilities are not in all cases arranged to be productive of the maximum possibilities of either broad efficiency or the greatest economy.

The United States is connected with this world system, but on one side as a contributing field to be reached and exploited, and not primarily as a center. This must be changed and the United States put into its relative world position, put into the focus of a world system of electrical intercommunication, as one of the most, if not the most, important center of commerce, industry and finance, that full advantage may be taken of its position and the opportunities now existing.

We must give our commerce what it needs and what the commerce of the old countries already has. Our international wire service has become a "utility of necessity" and must be treated accordingly.

From the United States to the greater part of the world, electrical intercommunication is expensive and roundabout.

While we have communication with South America, our South American elcctrical communication now goes through several intermediate countries and the interchange between the Eastern Coasts of North America and South America has to cross either two continents or two oceans. While we have one cable between the Pacific coast of America and the Pacific coast of Asia, one cable for such a distance and such an extent must necessarily be uncertain and more or less indirect. The East coast of South America must have a direct cable to the United States entirely under control of American interests and not a foreign connection. There must be a North Pacific cable connecting the United States wire system with the Asiatic wire and cable system, and an

alternate route to Europe across the Eastern continent. Where our communication must necessarily pass through other countries we should have alternate routes passing through different countries.

By utilizing and unifying the operations of the existing and abundant transatlantic cable facilities, direct connection can be established with every country in Europe through some immediate rearrangement, and as soon as possible some relaying, relocating, some extension of the old and the laying of some new cables.

While private property must be respected, proprietary rights should not be allowed to obstruct this solution, any more than proprietary rights of any utility should prevent regulated or controlled operation. The constitutional rights in each case are identical.

While our national wire systems are wasteful in superfluous plant, our international wire systems are correspondingly as deficient, especially in the location and arrangement of plant.

To meet our national requirements, we must have a combined intra- and inter-national electric transmission service which will place all of our great centers in quick and close and available communication with the great centers of every country with which we have developed or potential business.

The United States must be brought into the center of a world system of electrical intercommunication. Its ships and merchants must not depend upon the gracious courtesy of any other country to get direct home wire

communication. If there is not, there should be an international comity which will allow this. If done thoroughly, this must be done under the aegis of governmental authority, through specially shaped legislation. Much can be done by the present cable systems combining and operating in close connection with the land systems. To do a thorough piece of work, however, there must be considerable expenditure of capital on relocation, extension, etc., and if we are to have an independent international cable system, we must be independent of foreign cable manufacture. For our extensions and repairs, we must not be dependent upon any other nation. In an international system there would be sufficient demand to warrant the establishment of a cable manufacturing plant in the United States.

The most immediate part of the programme, the part that will bring the quickest results, is the unifying and co-ordinating of the existing cable systems, followed as quickly as possible by such relocating as can be done at once, and by laying, as soon as possible, the East-Coast cable.

This country is spending thousands of millions of dollars to build ships to compete for foreign commerce and yet leaves the very "essential" to the building up of foreign commerce—quick reliable intercommunication—entirely to private initiative and to foreign enterprise. With as many tens of millions and the co-operation of the existing cable companies controlled in the United States, a system could be built up which would put the business of the United States, as it were, at the front-door of every

business house of the world, and while it would need government aid at the start and until established, it will be indirectly profitable from the start and without doubt will be profitable in time.

I do not think there is any question about the wisdom of the policy, one grand system reaching to all countries with which we have relations, extending as rapidly as possible to all other countries in which potentialities exist, fostered by the Government at the start. It is to be regretted that the questions of government ownership and of superior foreign rights have been brought into this cable question to handicap the solution of this big and most important problem, which must be settled from an American standpoint by some co-ordinated correlated combination of government authority and private operation or operation founded on the best traditions of private operation free from political interference and combined in a federalized corporation.

When all this is done, working in close connection with or under the close supervision of the land system, the United States would have the most complete, comprehensive system of world intercourse and intercommunication in existence.

This cannot be done directly by the Government although some Government encouragement and aid at the start will be needed. There are many points of an agreement to be reached between alien individuals and corporations, there will be much dealing with the respective governments which would be confined to the interests

and questions involved if conducted by private individuals, but which might become international questions, although purely local, if the Government were directly involved.

If, however, all the advantages of the government prestige together with the admitted advantages of private operation under government control could be obtained, it could be done by some new organization, or by one of the old organizations as a nucleus about which to create the system—this corporation to be federalized and under government auspices and regulation.

The attempt recently made to make an international question or raise a question as to the right of the United States Government to direct the operation of cables, owned and controlled and terminating in the United States, so as to obtain the greatest efficiency in a time of abnormal demands, emphasizes the fact that the United States should have at least equal facilities to those of other countries and at least equal control over the facilities terminating in the United States.

There must be no question as to the right or the necessity of the United States to build up a commercial international wire system of which the United States is the center, instead of remaining at one side of an international system which centers in the English Channel. Nor should there be any such a spectacle as an American-owned company obstructing the creation of an all-American cable system.

For what is the United States spending thousands of millions of dollars on means of transportation of American

commerce if it is to have no abundant available facilities for the agents who spread that commerce and if the ships that carry it cannot have a ready communication without the consent of any foreign nation?

Under the comity of nations in times of peace, citizens, mail carriers, ships, etc., have, subject to reasonable regulation, the right to land, land and to cross or pass in transit to other countries. The mails are communications of intelligence. The cable is a facility of intercourse and intercommunication—a carrier of intelligence. There should be—subject to reasonable and necessary regulations and restrictions, such as a sovereign country has the right to, and must prescribe for its own protection—the same rights as to the electrical transmission of intelligence.

In making this reply it has been my desire to present the actual conditions and salient features of electric communication and the possibilities of the future.

While some suggestions are made in this communication as to the requisite features of the future organization of these systems, no attempt has been made to set out the details of such a plan. If so requested, it would give me great pleasure to furnish your committee with more detailed suggestions as to what would in my opinion be the most practical solution.

Respectfully submitted,

THEO. N. VAIL.